The 3rd Five-Year Work Programme of the Network of Aquaculture Centres in Asia-Pacific

2001-2005

Network of Aquaculture Centres in Asia-Pacific (NACA)
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Preface

The Network of Aquaculture Centres in Asia-Pacific (NACA) is an intergovernmental organization with 15 member countries and five participating governments in the Asia-Pacific Region. It promotes rural development through sustainable aquaculture. NACA seeks to improve rural income, increase food production and foreign exchange earnings and to diversify farm production. The ultimate beneficiaries of NACA activities are farmers and rural communities.

NACA conducts development assistance projects throughout the region in partnership with governments, donor foundations, development agencies, universities and a range of non-government organizations and farmer associations.

NACA supports institutional strengthening and development of policies for sustainable aquaculture and facilitates collaborative R&D with a focus on rural development. The core activities of NACA are:

- Capacity building through educational and training;
- Collaborative R&D through networking among centers;
- Information and communication networks;
- Policy guidelines and improving support to policies and institutional capacities; and
- Aquatic animal health and disease management.

This document outlines NACA's third five-year work program for the period 2001-2005.

Contents

Glossary

AAHRI	Aquatic Animal health Research Institute
AAPQIS Asia	Aquatic Animal Pathogen and Quarantine Information System - Asia
AFS	Asian Fisheries Society
AG	Advisory Group
AIT	Asian Institute of Technology
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
BMP	best management practices
COFI	Committee of Fisheries
FAO	Food and Agriculture Organisation
FFRC	Freshwater Fisheries Research Centre
GC	Governing Council
ICLARM	The World Fish Centre
IT	Information technology
MRC	Mekong River Commission
NACA	Network of Aquaculture Centres in Asia and the Pacific
OIE	*Office International des Epizooties* (World Organisation for Animal Health)
R & D	research and development
RLCC	Regional Lead Centre for China
SCA	Sub-Committee on Aquaculture
SEAFDEC	Southeast Asian Fisheries Development Council
SEAFDEC AQD	SEAFDEC Aquaculture Department
STREAM	Support to Regional Aquatic Resources Management
TAC	Technical Advisory Council
TCDC	Technical Cooperation among Developing Countries
TOR	terms of reference
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Social and Cultural Commission
VSO	Voluntary Service Organisation
WB	World Bank
WTO	World Trade Organisation
WWF	Worldwide Fund for Nature
YSFRI	Yellow Sea Fisheries Research Institute

1 Introduction

This is the third *Five-Year Work Programme* of the intergovernmental NACA, and the first in this millennium. It will have two basic roles: to bridge the past 20 years and the next 20 and, more crucially, to set the stage for the development of aquaculture in the region for the years ahead.

Since NACA became operational in 1980 (establishment of NACA was proposed as one of the concrete steps in the Kyoto Strategy developed by the *FAO Technical Conference on Aquaculture* in Kyoto in June 1976), the past 20 years have seen Asian aquaculture evolve from a traditional practice to a science-based activity and grow into a significant food production sector, contributing to national economies and better livelihoods for rural and farming families.

Aquaculture used to be regarded as an infant in comparison with crop and livestock husbandry and capture fisheries. It has since transformed into one of the fastest growing food producing sectors, and globally is fast catching up with livestock production. Aquaculture is now a better-organized economic sector, and is currently characterized by stronger private sector participation and more state patronage in most parts of Asia. To underline its progress as a natural resource-based industry, aspirations for higher yields from innovations in production technology have since been tempered with concerns for its sustainability. As an economic activity, the exercise to derive higher returns has since been joined by schemes to distribute benefits equitably. As a commodity industry, the purposes of producing more food, earning higher incomes and improving economies are being expanded to ensuring food security and alleviating poverty.

These shifts in outlooks -- to be sure, not confined to aquaculture and prompted by global and social forces -- occurred towards the final stretch of the last 20 years. It is in the midst of these changes that aquaculture development in Asia finds itself. This then is the context of this Work Programme, as has been described by regional and global forums and exercises that in-

volved NACA and partner organizations. These forums and exercises have provided guidelines for this Work Programme.

This Third *Five-Year Work Programme* was drafted by the Secretariat, based on recommendations and review by the NACA Task Force. It contains the strategic areas proposed to be addressed and indicative actions to be taken. It was endorsed by the NACA Governing Council at its 12th Meeting held in November 2000 in Brisbane. The detailed work plans were developed further by the participants at the Sixth Technical Advisory Committee Meeting (TAC-6) held in Cambodia in May 2001 (Annex 2).

2 Background

The three major guides for the direction and content of this Work Programme are the following:

i) **Asian Regional Aquaculture Development Plan** prepared by the *Regional Planning Workshop on Aquaculture Development* held in Kanchanaburi, Thailand on 1-5 September 1999;

ii) **Declaration and Strategy for Aquaculture Development beyond 2000**, formulated by the *International Conference on Aquaculture in the Third Millennium* held in Bangkok on 20-25 February 2000; and

iii) **Draft Report of the NACA Task Force**, an independent group of experts mandated to recommend ways to strengthen the Network Organization; it visited 17 countries and territories from 6 August to 6 September 2000, but consulted 19 nations including Australia and DPR Korea. Consultations were held mainly with governments and other national institutions, the Secretariat, as well as other organisations.

The *Regional Planning Workshop* made the assessment that aquaculture, since the Kyoto Conference in 1976, has been transformed from a traditional practice to a more science-based activity, resulting in an eight-fold increase in production over a 20-year period. Such transformation was largely due to the increased emphasis on the development of aquaculture in the national economic and social development plans of most Asian states, thereby elevating its status to a level near to that of capture fisheries. The Workshop identified 15 strategic objectives and major actions to meet the objectives.

The themes of the 15 major actions are human resources development, environmental management, technology and farming systems development, seed supply and quality, aqua-culture feeds, aquatic animal health and disease control, policy, legal, social and investments, quality assurance and food safety, markets, institutional capacity and communications, and rural livelihoods. The above themes were not set in any order of priority as the 20-year regional plan should be considered as a long-term

guide for developing shorter-term *i.e.* 5-year rolling programs during which regional priorities can and will change.

The *Bangkok Declaration and Strategy* provides a blueprint for government and private sector actions for aquaculture development. Seventeen key strategy elements were identified by the Conference.

The strategy elements include: investing in people through education and training, investing in research and development, improving information flow and communication, improving food security and alleviating poverty, improving environmental sustainability, integrating aquaculture into rural development, investing in aquaculture development, strengthening institu-tional support, applying innovations in aquaculture, improving culture-based fisheries and enhancements, managing aquatic animal health, improving nutrition, applying genetics, applying biotechnology, improving food quality and safety, promoting market development and trade, and supporting strong regional and inter-regional co-operation.

The Task Force recommendations include strengthening of the networking structure, enhanced participation and ownership through engaging a wider range of stakeholders in NACA, and management and organizational matters that will be considered in the implementation of the Work Programme.

The R and D recommendations from the Task Force focused on technical areas, and were confined to national priority thrusts expressed to the mission by member countries. These include the following: aquaculture education; culture-based fisheries; cold water/mountain species culture and conservation, including an assessment of introduced cold water species; indigenous species development for aquaculture; coral reef aquaculture development focused on adverse environments; technology transfer in the artificial propagation and culture of marine finfish species; ornamental fish culture; feed formulation and development, and broodstock technology for selected species. Additional priority concerns highlighted in some countries relate to product quality and trade, investment and promotion of added value through giving more emphasis on aquaculture by-products.

In drafting this Work Programme, the Bangkok Strategy Elements were set in the context of the recommendations of the Kanchanaburi regional planning exercise in which 18 governments took part, and those of the NACA Task Force, which crystallized the expressed needs as well as priorities of the 19 governments and other stakeholders that were consulted.

3 Vision and strategy

The Asian regional planning exercise agreed on a *vision* and a *mission* statement for aquaculture in the region in this new millennium, as follows:

> "**Aquaculture shall be a major provider of food and will be applied to reducing societal disparities and inequities.**"

Based on this vision, the participants during the Kanchanaburi Workshop prepared a mission statement for the development of Asian aquaculture to:

i) Fulfill the aspirations of all sectors of the populace through a people-oriented approach focusing on aquaculture for development;

ii) Develop aquaculture in a responsible manner in harmony with the environment;

iii) Transform the emphasis of aquaculture from a resource-dependent activity towards a knowledge-based activity; and

iv) Continue to pursue the shared objectives of the governments through regional cooperation.

The Bangkok Declaration urged the following, which are relevant to the formulation of this Work Programme:

- that aquaculture be developed to its full potential so that it can make a net contribution to food security, economic growth, trade and improved living standards;
- that it be practiced as an integral component of development contributing to sustainable livelihoods of the poor;
- that policies promote viable farming practices that are environmentally and socially responsible;
- that states and private sector and other legitimate stakeholders co-operate to promote the responsible growth of aquaculture; and
- that regional/inter-regional co-operation be strengthened to increase the efficiency and effectiveness of aquaculture development efforts.

The NACA Task Force strongly recommends that ways be devised to increase the participation of all legitimate national stakeholders in NACA's activities, and urged that collaboration among regional and international agencies and organizations be improved so that their combined resources and efforts provide greater benefits to the peoples in the Asia-Pacific Region. The above-cited vision and mission statements, relevant excerpts of the Bangkok Declaration and recommendations of the Task Force suggest the following vision and mission for NACA in the new millennium:

> **"NACA shall assist member governments to improve opportunities for sustainable aquaculture development and to contribute to social and economic development in the Asia-Pacific region."**

Based on this vision, the mission of the organisation will be:

- To support cooperation in research and development with a focus on rural development through aquaculture.
- To support institutional strengthening and development of policies for sustainable aquaculture.

In line with this mission, the following seven principles will be adhered to, based on the global Bangkok Declaration, the aspirations of the governments as expressed during the Kanchanaburi Workshop, and recommendations of the NACA Task Force.

i) A basic shift in emphasis from aquaculture development to aquaculture *for* development, and attaining social and economic development objectives;

ii) Further emphasis on environmental sustainability and efficient use of natural resources through responsible aquaculture;

iii) Harnessing and integrating both science-based and indigenous knowledge to improve aquaculture technology, systems and management;

iv) Increasing use of information technology to develop and deliver environmentally sustainable innovations in aqua-

culture and promote cooperation in aquaculture research and development;

v) Strategic shift in the networking structure from institutional to more people-centered networking and broaden stakeholder participation in the network;

vi) Increasing reliance on technical cooperation among states; and

vii) Greater participation and more active involvement in inter-regional co-operative actions.

4 The Work Programme

The NACA Work Programme responds to the above vision and mission and principles through several major thrust areas. The details of each component will be subsequently developed by the TAC during 2001 as a detailed Two-Year Work Programme. The focus of the new NACA Work Programme will be **aquaculture for rural development**, involving people and communities in inland and coastal areas. In support of this broad objective for the development of aquaculture, this "core business" of rural development will be supported by the following thrusts:

a. **Capacity building through better educational and training programmes;**

b. **Effective R&D by facilitating collaborative networking among centers;**

c. **Information and communication;**

d. **Policy guidelines and improving support to policies and institutional capacities; and**

e. **Aquatic animal health.**

4.1 Rural development

Recognising the importance of aquaculture and living aquatic resources for rural livelihoods of people in most countries in the region, and the potential of improved aquaculture and aquatic resources management for poverty alleviation and food security, NACA will implement the Regional Aquaculture for Rural Livelihoods Programme, in partnership with other agencies with similar objectives and interests. The programme will support the governments and other stakeholders in the development of suitable policies and capacity to address poverty issues and rural livelihood development through aquaculture and improved aquatic resources management.

The programme will be an umbrella one for the organisation, linked to all other components of the Work Programme implementation. With the goal of increasing the impact of aquaculture on rural development and poverty alleviation, strategies are required to put people as the focal point for planning and

development for such programmes and to integrate aquaculture into overall rural development programmes.

The NACA regional programme will particularly seek to develop linkages between national extension services, integrate aquaculture planning within overall rural development planning, taking into account multi-sectoral developments and views, and multi-sectoral co-ordination which brings agencies together, awareness-raising in other rural development sectors of the potential of aquaculture to improve livelihoods, develop and use participatory approaches to involve stakeholders in policy-making, planning, implementation and monitoring; and document and widely disseminate of information on experiences and utilisation of good practices.

The 11th Governing Council meeting approved the programme concept and strategy; the detailed programme will be implemented from 2001. A technical cooperation programme (TCP) assistance that has been committed by FAO will be the catalytic activity to establish the necessary regional and national structures and set the essential processes at the regional, national, and community levels into motion. DFID has also expressed an interest to partner NACA and FAO in this initiative. The broad aim of the TCP will be to bring the programme into a sustained footing.

This rural development thrust will emphasise poor people and marginal communities. Initial activities will be geared towards proper identification of vulnerable communities and highlighting the needs and opportunities of resource-poor communities. Based on such initial assessments, further pilot scale activities will be initiated to develop effective intervention strategies. Information from the pilots will be widely shared, and feed into policy guidelines and policy and institutional support initiatives of the NACA member governments.

The Task Force consultations also recommended an emphasis in the programme on degraded environments. Vast stretches of inland, hilly and coastal areas in a number of countries contain large numbers of resource poor and particularly vulnerable people, but may have potential for development of aquatic resources and aquaculture. Some examples are those in Pakistan along the

lower stretches of the Indus River, the coast of Central Vietnam, the semi-arid areas of south and western China, marginal areas in plains and hilly areas in Cambodia, India, Indonesia, Pakistan, Nepal, Vietnam, and other countries. In light of the need to improve food availability, alleviate poverty and improve livelihood for marginalized people and minority ethnic groups in such areas, the Task Force considered the programme should give emphasis to such regions.

4.2 Education and training

Aquaculture education and training will be strengthened, as further investment in education and training is required to build the knowledge, skills and attitude of people involved in the development of aquaculture. Emphasis will be given to more effective use of modern training, education and communication tools, such as the Internet and distance learning, to promote effective regional and inter-regional co-operation and networking in the development of curricula, exchange of experiences and development of supporting knowledge bases and resource materials. Meanwhile, short-course training and technical exchanges will continue to be strengthened. The following are the three major areas.

4.2.1 Short-term training

NACA's short-term training programme, the *Integrated Fish Farming Course* based at the RLCC at Wuxi, will be continued. A more structured approach will be used, including regular courses and *ad hoc* courses to ensure: (a) greater participation of NACA centres in providing training; (b) coverage of relevant subject matter and (c) more involvement of NACA centres in the regular and ad-hoc training programmes within the available resources of NACA. Training programmes on various aspects of aquaculture will be developed in cooperation with identified resource centres and other cooperating agencies, under a structured regional programme.

The RLC in India has offered to host a regional course on freshwater fish farming, centered on carp aquaculture, and this will be given attention.

Training subjects identified by government participants during the Kanchanaburi planning exercise and those expressed during the Task Force consultations (i.e. coastal aquaculture by the Yellow Sea Fisheries Research Institute in China, small-scale household aquaculture by RIA No. 1 in Vietnam, and etc.) provide a basis for the development of the short-term training programme.

A system for accreditation, monitoring and post-evaluation of training programmes and trainees may be established. The organisation of training modules for different aquaculture courses and study tours organised by NACA, in ways that lead to formal professional qualifications may also be explored.

4.2.2 Regional Cooperative Aquaculture Education Programme

The development of a network of regional training and education providers is considered an important, cost-effective strategy that will enable countries to build up human resources in a coordinated manner. A cooperative mechanism, comprising a formal networking of key aquaculture education institutions in Asia, providing high quality aquaculture education, will therefore be developed. The programme framework and detailed implementation strategy, involving formal qualifications (possibly leading to a "Regional Aquaculture Degree;" credit transfers, delivery in the distance mode, use of Information Technology (IT) and others will be developed through widespread consultation in 2001, based on recommendations arising from the *APEC Project Cooperative Education Programme*. A small working group meeting is planned sometime in 2001 to develop the regional educational programme, in consultation with the governments and key aquaculture education providers.

4.2.3 Technical exchanges and TCDC

The technical exchange programmes of NACA will be further strengthened, and NACA's traditional and highly successful role in TCDC (Technical Cooperation among Developing Countries) to enhance bilateral and regional cooperation in aquaculture will continue to be the primary vehicle. Again, the expressed needs of states, especially R&D institutes, as well as private sector, as

reported by the Task Force and compiled at the Kanchanaburi meeting, provide a good basis for further developing and strengthening technical exchange programmes. Efforts will be made to cooperate closely with FAO and UNDP in implementing TCDC activities. A new area for exchanges that has been strongly proposed by some governments is farmer-to-farmer exchanges.

4.3 Research and development cooperation

Research and development collaboration among NACA centres will be strengthened in the new Work Programme, supporting development of aquaculture in freshwater, brackishwater and marine environments. A coordinated and cooperative approach to research and development among institutions within the region will be promoted within well-structured programmes, involving existing and new centres as appropriate, and participation of stakeholders, including the private sector.

The approach emphasises development of technology and farming systems, within the context of environmental, social and economic concerns and broader human development objectives. A multidisciplinary approach will be promoted to support the responsible aquaculture development and improvement of livelihoods of inland and coastal peoples. The basic aim of bringing aquaculture on a par with livestock husbandry demands a continuing inter-disciplinary research thrust and through a well-coordinated research programme involving the essential disciplines.

Research and development cooperation will center around four major thrust areas:

4.3.1 Coastal aquaculture

A coastal sub-programme will support and promote regional cooperation in the development of aquaculture in coastal areas. The work will build further on existing experiences under the *UNDP/FAO Seafarming Research and Development Project* and more recently the *APEC/NACA Grouper Research and Development Network* and the World Bank/MacArthur Foundation supported *Shrimp Farming and the Environment* studies. The em-

phasis would be on environmentally sustainable coastal aquaculture within the context of integrated coastal area management, extension of existing knowledge and experiences, and co-operative research as required on the development of new or improved marine farming technologies and practices, based on understanding of market opportunities and needs. Partner-ship with centres, agencies and institutions with multi-disciplinary expertise in coastal area management and other sectors with mutual interests in coastal area development will be further promoted.

The following areas are included in the sub-programme:

- **Technological research and development** concerned with the artificial propagation and culture of marine finfish species and other species and seafarming systems, including integrated systems to improve environmental performance of coastal aquaculture and emerging technologies such as offshore marine cage culture.

- **Development and support to implementation of "best practice"** management systems, with an initial emphasis on environmentally sustainable coastal shrimp aquaculture and marine cage culture. Support to the development and implementation of suitable Codes of Practice, and of the FAO Code of Conduct for Responsible Fisheries, will also be continued.

- **Integration into coastal area management.** Development of strategies and capacity (of government, local communities, other stakeholders including NGOs) for planning and integration of aquaculture into coastal area management, and balanced use of coastal resources, including zoning, integration with coastal coral, mangroves and other ecosystems.

- **Outreach and partnership** promoted to ensure effective cooperation in development and widespread dissemination of results arising from the research. The component would build further on the previous seafarming, coastal manage-ment and marine fish projects to forge an effective regional cooperation for responsible coastal aquaculture development, within the context of coastal area management and coastal community development. The preparation of the workplan,

including responsibilities of participating centres and partners, will be prepared through widespread consultation in 2001.

4.3.2 Inland aquaculture

The future development of aquaculture in rural, inland areas of Asia, is essential for food security, improved livelihoods and diversification of agricultural farming systems. Due to its longer history, technologies for inland aquaculture are relatively better developed than for coastal aquaculture within the region. Further emphasis is required more on dissemination of existing experiences and technologies, increasing productivity of existing farms, and increasing the number of farmers involved in aquaculture.

As we move into the next two decades, water and possibly land for aquaculture will become critical issues in some countries, and new opportunities for aquaculture development will also emerge through improvements in technology and farming systems. This sub-programme will therefore promote research cooperation in the development and adoption of the range of species and farming systems in inland areas, building further on the experiences of freshwater farming systems research and development in the Regional Centres in China, India and Thailand, and elsewhere over the past 10 years.

Strong emphasis will be given to partnership among centres, agencies and institutions, including those with expertise in other sectors and with a mutual interests inland aquaculture in the context of rural development, including agencies with more experiences in agriculture research.

The following are the areas included in the sub-programme:

- **Research and development of resource-efficient farming systems** that make efficient use of water, land, and seed and feed inputs. Efficient use of water will be given particular attention.
- **Culture-based fisheries**, including reservoirs and restocking of natural floodplains and other water bodies have considerable potential for increasing fish supplies from freshwater fisher-

ies and generating income in rural areas. These practices provide important opportunities for resource poor sections of the population to benefit from relevant aquaculture technologies and permit efficient use of under-utilised, new or degraded resources.

- **Development of planning strategies** to integrate aquaculture into inland watershed management plans and lakes/reservoirs (including cage culture) and ensuring that aquaculture developments are within local and regional carrying capacities.
- **Outreach and partnership** would be promoted to ensure effective cooperation in development and dissemination of results arising from the research.

The sub-programme would build further on the previous inland farming activities to build an effective regional cooperation for inland aquaculture development, within the context of rural development and agricultural diversification. The detailed workplan, including responsibilities of the various participating centres, will be prepared in early 2001.

4.3.3 Feed resources, formulation and management

Feeds and fertilisers are the major economic costs in many farming systems, and their use has environmental implications. Concern is growing about the use of fishmeal and oils in some aquatic animal diets, stimulating a need for research on replacements and making efficient use of feed resources. Continued efforts in aquaculture nutrition research and feeding strategies will therefore play an essential role in the sustainable development of aquaculture. Further development of feeds is required for efficient use of resources and reduction of feed waste and nutrient discharge. A strategic assessment of aqua-culture nutrition status and requirements needs to support sustainable aquaculture development is required to develop an effective programme of cooperative actions, including the private sector, to address specific issues. The following areas may be considered:

- Development of feed using local raw materials, and improvement of the use of agricultural and fishery by-products

and non-food grade feed materials, and basing feeding strategies, wherever possible, on the use of renewable feed ingredient sources.

- Improving the understanding of the aquaculture farming systems and the potential nutrien loads and losses to the environment, to maximise nutrient retention efficiency.
- Preparation in the form of manuals of "good aquaculture feed manufacturing practice" and "good on-farm feed management."

This sub-programme will be based on collaboration among a number of well-developed centres in aquaculture nutrition, and outreach to centres and countries with lesser-developed skills. In order to prepare such a cooperative aquaculture nutrition research and development network, an initial expert meeting of aquaculture nutrition researchers, including the private sector, will be convened in 2001 or early 2002 to review needs and responsibilities. The previous experiences of the Asian Fish Nutrition network will be considered in the further development of this component.

4.3.4 Seed quality and aquaculture genetic resources

A sufficient supply of healthy, quality seed is essential for aquaculture development in the region, as is maintenance of healthy fish population. Genetics also has an important role to play in increasing productivity and sustainability in aquaculture through higher survival, increased turnover rate, better use of resources, reduced production costs and environmental protection. Similarly, efforts need to be taken towards applying aquaculture in conservation of native genetic resources, which are under threat.

Recognising that aquaculture has not benefited as much as terrestrial animal husbandry from the adoption of best practices such as selective breeding and stock improvement programmes**,** higher priority will be given to the application of genetics in aquaculture in the Work Programme. Partnership with other regional, national and international agencies will be strongly en-

couraged in a cooperative programme approach. The sub-programme will include the following areas:

- **Domestication and broodstock.** Developing and utilising improved domestication and broodstock management practices and efficient breeding plans to improve production in aquatic animals. Promotion of cooperation in domes-tication programmes of key species, including *Penaeus monodon,* will be given attention.
- **Aquatic biodiversity**. Exploring the opportunities for greater application of genetictechnologies to the conservation of aquatic biodiversity.
- **Development of standards (national and regional)** on seed quality, health maintenance, including the promotion of healthy seed and standards for accreditation of hatchery for supply of quality seed, as well as distribution and licensing mechanisms. As recommended by the Beijing meeting, a model Code of Practice for hatchery operators may be drafted for dissemination throughout the region.
- **Indigenous species.** Research and development concerned with the induced breeding and culture of indigenous fish, including special programmes for the Himalayan and Mekong sub-regions. An assessment/evaluation of exotic species, including introduced cold water species, will also be undertaken as part of this component.

4.4 Policy development and institutional support

A key issue for the growth of aquaculture will be the ability of countries and organisations to strengthen policy and institutional capacity to develop and implement policies and regulations that are both transparent and enforceable. As globalisation proceeds, it will also be important for the region to develop appropriate policy and a common voice on certain key issues, to seek to influence global trade discussions as they affect aquaculture, for example in the upcoming new round of WTO trade negotiations. The role of NACA as a regional collaborative organisation promoting good governance will become more important under such circumstances. The Work Programme will therefore

continue to emphasise sharing of information and support to development of policy, and promote effective discussions and cooperation among members. In this regard, the Governing Council should become a more active forum for exchange and cooperation in the development of common stands/views/influence on key regional issues and policy discussions. The ongoing support to development of technical guidelines and support to the implementation of the **Code of Conduct for Responsible Fisheries**, and other relevant regional and international agreements affecting aquaculture development, will be continued. The following activities will be promoted:

- **Sharing of information** on policies and legislation, rules and procedures that encompass best practices in aquaculture, for example through advice on site identification and selection, planning for integrated development and zoning of aquaculture activities.
- **Capacity building of institutions** to develop and implement responsible aquaculture development strategies, such as through training, policy advice and regional technical and information exchanges.
- **Continued promotion of cooperation** with regional organisations such as APEC, ASEAN, SAARC, MRC, SEAFDEC, and AIT, amongst others, and with relevant international organisations including FAO, WTO, OIE and ICLARM.
- **Preparation of policy guidelines** and briefing documents and materials for use of member countries, including development and implementation of Codes of Conduct and Codes of Practice. There are some specific issues of policy concern for the region which have been identified by government representatives during the Kanchanaburi Workshop, and in other recent meetings and workshops convened by NACA, as follows:
  - **Responsible trans-boundary movements of exotic species.** The development of Asia regional technical guidelines for the responsible trans-boundary movement of live exotic aquatic animals be developed in due course, specifically

addressing the issue of introduction and impacts of exotic aquatic animals and biodiversity.

- **Biotechnology as a science** has the potential to impact on all food production sectors. The Aquaculture Millennium Conference suggested that in the future the aquaculture sector will confront the issue of biotechnology through: developing and applying biotechnological innovations for advances in nutrition, genetics, health, and environmental management; addressing the potential implications for aquaculture of biotechnology, including GMOs and other products, in a precautionary, safe and practical way; and encouraging public awareness and providing information to consumers on the potential applications of biotechnology. A special assessment will be carried out in order to find an appropriate policy direction for the NACA member governments on these issues.

The Governing Council is expected to play a more active future role in policy discussions and common issues concerning aquaculture development within the region, and make recommendations on policy direction and issues to be looked into by the NACA organisation.

4.5 Information technology and communications

This is an umbrella programme that will support and integrate all the other programme components as well as the participants in the NACA networking mechanism. It comprises the network information flow as well as the content. A priority activity -- in the face of the need to increase the participation of as many experts as possible in NACA activities with as little cost as possible -- will be to improve and promote the electronic communications. This will include the development of a more useful homepage with the view of becoming a one-stop shop for information on technology, investment and policy guides, research activities, and results, workers, institutions, services, *etc*. Immediate attention will be given to the collection of most recent or current aquaculture statistics from states as indicative planning tools; development of the databases (in addition to the farmers' groups and organizations) on farmers' consortia and federations, indus-

trial firms, R&D workers, and ongoing and recently finished research. This will be accomplished through a tailored portal on the NACA website providing information on Asian aquaculture.

As identified in the *Information for Policy Session* in the *International Conference on Aquaculture*, development and dissemination of policy guidelines and indicators of aquaculture performance will be among the priority activities during the third work programme period. The specific topics for policy and brief development are indicated under Section 4.4 (Policy development].

The core of NACA's information system will be its electronic component. The Task Force has recommended the development of *eNACA* that will have the three basic functions of serving as a one-stop shop for information needs (and links to information sources) of various users of information; providing effective linkages among R&D workers to carry out the Task Force con-cept of a 'people-centred or expertise-oriented network'; and to facilitate forums for identifying, crystallizing and/or proposing solutions to common regional issues (the discussion issues will be further identified by TAC-6).

The present regular components that include the *NACA Newsletter*, *Aquaculture Asia*, *Electronic Grouper Newsletter*, and the Aquatic Animal Pathogen and Quarantine Information System - Asia or AAPQIS-Asia, will continue and will be further developed and improved. Additional information packages and databases, as required or spawned by specific projects, will be developed and placed on the Web.

4.6 Aquatic animal health management and disease control

As aquaculture makes its transition to a major food-producing sector, it is essential to minimise the risk to farm productivity and the livelihoods of people involved in aquaculture from disease outbreaks. Aquatic animal health will therefore continue to receive attention in the Work Programme. The Asia Regional Aquatic Animal Health Management Programme of NACA, implemented in cooperation with FAO, with guidance from OIE, and support from various agencies will continue to be developed, and particularly for implementation of the *Asia Regional Technical Guidelines on Health Management and the Responsible Movement of Live Aquatic Animals*, based on the strategy prepared by participants during the Beijing meeting. Sharing of experiences and resources through regional and sub-regional cooperation provides essential support to national-level implementation of the *Technical Guideline*s. Important activities at the regional level to be supported under the Work Programme are as follows:

- **Asia resource centres for aquatic animal health.** A more cohesive networking among regional resource centres in aquatic animal health will be developed to provide diagnostic support and to build capacity for aquatic animal health, in cooperation with OIE.

- **Harmonisation of procedures for health certification, quarantine and diagnosis.** Regional co-operation will be used to harmonise, as far as possible, quarantine procedures, diagnostic procedures, health certification and other measures with respect to aquatic animal health. NACA has been requested to co-operate with other relevant bodies, including OIE, FAO, APEC and ASEAN to assist in harmonisation of such measures.

- **Support to capacity building.** Regional and sub-regional co-operation through the aquatic animal health resource centres would be enhanced to assist in building the skills and knowledge base required for improved aquatic animal health. A special region-wide co-operative effort is required to support the general adoption of Level I diagnostic capacity

throughout the region and further regional training programmes will be developed for capacity building for Level II and Level III disease diagnosis. Short-term regional training and workshops should be developed to build aware-ness and capacity on (a) import risk analysis, (b) epide-miology and surveillance techniques, (c) zoning (d) contin-gency planning, (e) molluscan and marine finfish diseases.

- **Awareness raising, communication and information exchange.** At the national level awareness should be raised within the farming sector and government administrations concerning the economic and social benefits to be gained from implementation of the *Technical Guidelines*. Further develop-ment of AAPQIS-Asia will be undertaken to provide aquatic animal health information to the region.

- **Regional and national disease reporting.** The regional disease reporting system will be continued and further developed and improved with the aim of providing countries with accurate information regarding the occurrence and distri-bution of diseases with important trade significance to form the basis for providing prevention and control strategies and early warning systems. National quarterly reports will continue to be prepared and submitted to OIE and NACA/FAO, quarterly reports disseminated by NACA/FAO and OIE, and effective feedback mechanisms at both the national and regional levels established.

- **Emergency response.** National (including farm level) and regional contingency plans need to be developed to ensure there is quick and effective response to new serious disease outbreaks. OIE, FAO and NACA are requested to organise a regional workshop to share such experiences, provide guidance for development of national contingency plans, and develop a practical Asia-regional emergency response mechanism.

- **Joint activities for risk reduction in shared watersheds.** A pilot exercise in disease zoning will be carried out to determine the feasibility of zoning for shared large watersheds, contiguous river systems and marine coastal areas in the Asia Region (*e.g.* the Mekong or Ganges river systems, the Bay of

Bengal or the Sundarbans coastal area). Experiences from such pilot testing should be widely shared with countries throughout the region. In support of the further development of the regional programme, an Advisory Group on Aquatic Animal Health (AG) should be established and made operational under NACA. The role and membership of this regional advisory group would be such as to ensure to provision of expert advice to NACA on the implementation of the *Technical Guidelines.*

5 Programme implementation

This component of the Work Programme concerns the planning, coordination and management of the programme as described below.

5.1 Planning, coordination and management

The planning, coordination and management of the programme are core programmes that are, traditionally, the responsibility of the NACA Secretariat. The Governing Council provides policy guidance and technical advice is provided by the Technical Advisory Committee. The functions of these three main bodies of the organisation are provided for in the NACA Agreement. Under the new Work Programme, and in response to the recom-mendations of the Task Force, more emphasis in programme implementation will be given to the member governments, and the various centres participating in the network activities. In other words, there will be a much greater emphasis on participation and ownership, under a well-formulated prog-ramme of work, in the activities of the network.

5.2 NACA "centres"

The NACA centres will continue play a leading role in implementation of the regional work programme. The Task Force recommends a generic nomenclature for all centres – NACA Collaborating Centre, as distinct from NACA Centre – to emphasize that a centre is owned by a state or territory or a stakeholder within it and participating in the NACA networking activities. Based on the recommendations of the Task Force, there will be a broadening and restructuring of the NACA network to include (i) the existing lead centers, (ii) new NACA Collaborating Centres as proposed by certain states, (iii) people- or expertise-centered networks; and (iv) a sub-regional office in the South Asian region as well as national "cells" or offices to facilitate communications with stakeholders and the public.

Placing new emphasis on people-centered networks is in line with the need to involve cost-effectively more participants and resources (intellectual especially) in the NACA activities by tak-

ing advantage of the new information and communication technologies. On the other hand it is recognised that the same experts work in the various centres and institutions, which have institutional distinctive competencies that can complement those of others and enrich the regional pool of resources. In other words, the institutional networks will complement the people networks. The idea of NACA Collaborating Centres was endorsed by GC-12.

The TAC will subsequently identify and develop the programmes. A study will be made to determine the location, structure and functions of the sub-regional office and national offices. Based on the recommendations of the Task Force, there will be a broadening of the center concept to include new centres to meet the broadening scope and depth of work required by the network. The designation of Aquatic Animal Resource Centres for Aquatic Animal Health will be a pilot example of the broadening of the "centre" `concept. The role of the identified Aquatic Animal Resource Centres for Aquatic Animal Health will be:

- To provide laboratory services on disease samples submitted by different laboratories/field sites to assist in making presumptive diagnosis (Levels I and II) of the disease in question;
- To provide "second opinion" confirmations for Level II/III laboratories which made preliminary diagnosis, and maintain confidentiality of results; and
- To participate in the Regional Aquatic Animal Health Programme as a referral laboratory (as above) and as participating centers to provide technical training, research attachment mechanisms for the diseases for which they have expertise.

5.3 Role of the NACA GC and TAC

The role of the Governing Council (GC) is in the overall policy setting for the intergovernmental NACA, and the Technical Advisory Committee in providing technical advice in the development and implementation of the Work Programme. Based on the recommendations of the Task Force, the GC members have a central role as focal points for the coordination of aquaculture development in their respective member countries. The GC will be more proactive in looking for collaborative support to NACA and communicate more the NACA activities to institutions, and offices other than their own (focal) agency.

Some GC members are focal points for council members/country representatives for other regional bodies such as ASEAN, SEAFDEC, MRC, etc. It will be in the best interest of all if the GC could be the source of appropriate information regarding the different projects and activities of NACA to ensure complementarity and establishing appropriate linkages to other projects to avoid competition and duplication, ensure maximum use and avoid unnecessary waste of limited resources.

The GC members also have an important role in involving people from other agencies and institutions and centres in NACA activities rather than restricting participation to themselves or their own people, and get NACA to be involved in the activities and projects being planned to be implemented in association with NACA centres by other organizations and institutions.

More active dissemination and integration of NACA's work, projects and results into member countries' aquaculture development policies and programmes through the GC members is also required. It is suggested that GC representatives should also report during the GCM in which the countries participated, how they benefited and to identify mechanisms for further national involvement.

As to TAC, the Task Force report asks the GC members not to be members of TAC at any time; that TAC meets once in two years but should also try to have an e-conference or consultation between those two years; that TAC members should not be restricted to those working in the national focal agency of NACA;

and that TAC may include two independent experts. The TAC-6 will have the primary responsibility for the future development of the detailed Work Programme.

5.4 Technical expertise for programme implementation

The technical expertise to organise and implement the programme, as well as to provide specialist advice and inputs to the component activities, will come from a number of sources, and a combination of schemes.

5.4.1 NACA "centre" staff

The staff of centres will and take part in expert-oriented networking according to their specific areas of expertise. The advantage here is that while the centre may be restricted to taking part in a single or limited numbers of networking activities depending on its area of excellence or distinctive competence, its own experts can talk part in the numerous expert-networks that could either be disciplinary, systems, integrated or multidisciplinary, development concern i.e. environmental sustainability; development tool i.e. education and training; and any conceivable area. To facilitate more effective networking, States should facilitate "wiring" their centers to ensure easy access through electronic means to the other centres and NACA members.

5.4.2 Core staff

The basic technical expertise for project development and implementation mechanism will be provided by the NACA in-house secretariat personnel that consist of specialist core staff. Beginning with only two experts including the coordinator and information specialist in 1992 and 1993, the present core staff has increased to include a senior aquaculturist, an aquatic animal health specialist and programme and operation officer concerned with the development, organisation and implemen-tation of training and technical exchange activities.

In addition to the current complement of core staff, the new Work Programme will be augmented by the addition of one new core staff with social and economic skills (already approved in

the 2nd Work Programme) and experiences in aquaculture for rural development and database management and information technology specialist.

5.4.3 Non-core staff

The core staff complement within the Secretariat may, as required, be augmented in various ways depending on the Work Programme activities.

- **Seconded staff**

Seconded personnel are the equivalent of associate professionals, whose services and technical expertise supplement that available in the Secretariat. The length is short-term, subject to extension as required. The seconded personnel also acquire further expertise and experience, while working within the Secretariat that will be useful in their work and enhance the participation of their institution or agency in regional activities of the network. The secondment programme will be given more emphasis in the new work programme.

- **Project staff**

These are specialists within the Secretariat, or based within member countries, possessing specialist skills and experience needed to assist NACA in formulating and executing specific projects. Remuneration of the project staff is from the proceeds received from implementation of a project, or programmes. The Task Force proposed to hire an additional project staff with experience in aquaculture project development and implementation.

- **Associate professional officers**

These are junior technical personnel assigned and fully supported by collaborating agencies to work either at the Secretariat or in specific projects that may be located elsewhere. Their services are for a short period, and meant to supplement available secretariat or project expertise. Their participation in NACA is meant to also improve their own technical expertise for the benefit of their sponsor institutions.

- **Reserve staff**

NACA has a roster of technical personnel in various fields and levels of expertise that may be called upon to perform specific assignments in a project, or an activity including study tour and training. A number of projects have been assisted by some reserve staff, such as feasibility studies, design of hatcheries and provision of advisory services.

- **Collaborating agency staff**

In certain cases, a collaborating agency will assign, for a short period, a staff to work at the NACA Secretariat on certain aspects of a project being jointly implemented by NACA. Through special linkages with Universities, post-graduate fellows and/or volunteers having the required expertise may also be accommodated within the Secretariat, or be offered scholarships, when their work is contributing to the overall Work Programme.

- **Specialist working group**s

Specialist working groups comprise experts convened for a specific task under the Work Programme. They are technical experts on the various disciplines required to execute the task. The development and review of guidelines and preparation of other information materials has been facilitated though such working groups. For example, a specialist Asia Advisory Group on Aquatic Animal Health will be convened in the Work Programme to provide specialist advice on the implementation of the Regional Aquatic Animal Health Programme. Other similar specialist groups may also be formed as necessary.

5.5 Programme finance and organisation

Funding of the programme will be through a combination of two schemes: (i) first, the *core fund* consisting of member annual contributions; and (ii) second, *project development and other technical services*.

5.5.1 Core fund

This fund comes from the member governments' pooled obligatory contributions that are earmarked for the core activities of

NACA. The government contributions, in-kind and through TCDC, will constitute an additional contribution to the activities of the organisation.

5.5.2 Project development and services

As emphasised by the Task Force, mobilisation of funds through projects and services will continue to remain an important part of the work of NACA and the implementation of the programme.

- **Sustainable aquaculture fund**

A feasibility study (and implementation as appropriate) will be carried out for the "Sustainable Aquaculture Fund" concept, as identified in the Second Work Programme, that has the aim of establishing a special fund, using government, donor and private sector resources, to support investment in research, capacity building and development of aquaculture in the region. The *International Conference on Aquaculture* and the *Kanchanaburi Regional Aquaculture Planning Meeting* both emphasised the importance of establishing suitable investment schemes for aquaculture, including schemes that support small-scale sector development. The concept was approved by the Seventh NACA Governing Council Meeting.

- **Technical servicing arm**

Technical servicing activities have increased significantly over the past five years, and further emphasis will be given to this mechanism for generating funding support to the Work Programme. Additionally, emphasis will continue to be given to the development of projects for the development and implementation of the Work Programme.

To implement the above activities, it is suggested a small project development and services unit be established in the NACA Secretariat.

This project development and services will provide a more concerted and coordinated effort to project development, servicing and implementation, and establishment of the SAF and servicing. Seconded staff may also develop project development and

management skills through their association with such a unit. The support unit may also be called on by NACA members for the development of donor and other development projects.

5.5.3 Partnerships and donor organisations

International development assistance is becoming increasingly directed towards poverty alleviation and needs to adhere to basic principles of social equity, including gender equity, environmental sustainability, technical feasibility, economic viability and good governance. The level of risk is important when supporting initiatives to address poverty alleviation. To make efficient use of international donor resources, a programme approach to multi-sectoral development under which donors can more effectively co-operate and collaborate with each other was recommended by the Aquaculture Millenium conference. The NACA intergovernmental organisation will promote partnerships and coordination with donors to adopt more cohesive approaches and procedures to support development of aquaculture in the region.

5.5.4 Inter-regional cooperation

There are growing numbers of request to NACA for cooperative assistance with aquaculture development in other regions, particularly Africa and Latin America. Such activities will be undertaken without affecting core activities and use of the core fund, based on the principle of TCDC. NACA will seek cooperation and assistance from other organizations and agencies working in these regions on these activities. NACA will also play an active role in linking Asia into the global intergovernmental aquaculture development forum as proposed by the International Conference on Aquaculture in the Third Millennium.

6 Budget requirements

6.1 Planning, coordination and management

The indicative operational budget covering the years 2001-2005 is attached as Annex 1. The core staff budget includes the new positions for a socio-economist (with rural development skills) and database and information specialist.

6.2 Implementation

The external funding requirement to implement the elements of the Work Programme will be estimated on a specific project or activity basis. Wherever appropriate and applicable, activities will be implemented through TCDC arrangements in line with the objectives of cost-effectiveness and regional self-reliance in programme implementation.

Annex 1

Indicative Operational Budget Covering the Years 2001-2005

Planning, Coordination and Programme Management						
	TOTAL	**2001**	**2002**	**2003**	**2004**	**2005**
Professional Staff						
Coordinator	165,768	30,000	31,500	33,075	34,728	36,465
Sr Aquaculturist	159,138	28,800	30,240	31,752	33,340	35,006
Socio-Economist	145,876	26,400	27,720	29,106	30,561	32,089
Information Specialist	145,626	26,355	27,672	29,056	30,509	32,034
Fish Health Management Specialist	125,320	22,680	23,814	25,004	26,255	27,567
Programme Officer	116,617	21,105	22,160	23,268	24,431	25,653
Database Specialist	99,461	18,000	18,900	19,845	20,837	21,879
	957,806	173,340	182,006	191,106	200,661	210,693
Allowances and Benefits	607,818	110,000	115,500	121,275	127,338	133,705
Subtotal	1,565,624	283,340	297,506	312,381	327,999	344,398
Seconded Staff						
Cost of Living Allowance	165,000	30,000	30,000	35,000	35,000	35,000
Subtotal	165,000	30,000	30,000	35,000	35,000	35,000
Administrative Staff						
Secretary	78,580	13,940	14,776	15,663	16,602	17,599
Administrative Assistant	71,703	12,720	13,483	14,292	15,150	16,058
Accounts Clerk	20,721	3676	3,896	4,130	4,378	4,641
Administrative Clerk	29,504	5,234	5,548	5,881	6,233	6,608
Library Clerk	26,196	4,647	4,926	5,221	5,535	5,867
Driver (1)	18,050	3,202	3,394	3,598	3,814	4,042
Driver (2)	17,994	3,192	3,384	3,586	3,802	4,030
Housekeeper	15,682	2,782	2,949	3,126	3,313	3,512
	278,430	49,393	52,356	55,497	58,827	62,357

Annex 1 *(Continued)*
Indicative Operational Budget Covering the Years 2001-2005

Allowance for Support Staff	69,612	12,349	13,090	13,875	14,708	15,590
Subtotal	348,042	61,742	65,446	69,372	73,535	77,947
Duty Travel	170,000	30,000	30,000	35,000	35,000	40,000
Total Personnel	2,248,666	405,082	422,952	451,753	471,534	497,345
Meeting and Workshop						
Technical Advisory Committee Meeting	95,000	30,000	0	30,000	0	35,000
Governing Council Meeting	165,000	30,000	30,000	35,000	35,000	35,000
Total	260,000	60,000	30,000	65,000	35,000	70,000
Equipment & supplies	75,000	15,000	15,000	15,000	15,000	15,000
Operation & maintenance	165,000	30,000	30,000	35,000	35,000	35,000
Printing & publication	56,000	10,000	10,000	12,000	12,000	12,000
Auditing of Accounts	18,600	3,500	3,500	3,800	3,800	4,000
Miscellaneous	25,000	5,000	5,000	5,000	5,000	5,000
Total	339,600	63,500	63,500	70,800	70,800	71,000
GRAND TOTAL	2,848,266	528,582	516,452	587,553	577,334	638,345
Less Host Government Contribution	90,000	18,000	18,000	18,000	18,000	18,000
TOTAL	2,758,266	510,582	498,452	569,553	559,334	620,345

Annex 2

Work Plan June 2001-Dec 2003
Summary of Deliverable Outcomes[1]

I. Support to Regional Aquatic Resources Management (STREAM)

1. Launch of STREAM in 2001
2. In-country multi-sector consultations to clarify STREAM concept, purposes and mechanics, obtain broad multi-stakeholder consultations, ownership and commitment to participate in activities.
3. Selection of 3-4 countries to start with STREAM
4. Start-up implementation
5. Development and approval of the FAO-TCP to support STREAM
6. Develop a process framework for STREAM to:
   - monitor and evaluate the planned outcomes
   - report on governance and accountability

II. Inland aquaculture

1. Policy and management guidelines on efficient water use for aquaculture. Research, case studies (on best or good practices) and documentation of cases to be made that illustrate various aspects of or issues related to water use.
2. Research, technology transfer, including training and information development and exchange, on farm made low-cost Aquafeed (see VII, "Partnerships and Exchange for recommendation on networking")

[1]The Sixth Meeting of the Technical Advisory Committee held in Siem Reap, Cambodia on 16-18 May 2001 formulated the 2.5-year Work Plan for NACA based largely on the Governing Council-approved Work Programme for 2001-2005. The final output consisted of a draft work plan to be further developed through consultations by the Secretariat with TAC-6 representatives and other parties, as appropriate, for implementation starting June 2001. This annex presents the "deliverable outcomes" for the period June 2001-December 2003. NACA is further translating these into project proposals and activities.

3. Study of low cost treatment systems of discharge water (effluents) and solids.
4. Policy, management and socio-economics aspects of culture-based fisheries (based on the recommendations of the regional workshop on Reservoir and Culture-based Fisheries Biology and Management, 15-18 Feb 2000, Bangkok). The particular areas for study during the Plan period will be identified after further consultations.

III. Coastal aquaculture

Development and support to implementation of "best practice"

1. Information dissemination and experiences on better management practices (BMPs) for shrimp aquaculture shared between members. This should be accompanied by assessments of current BMP programmes, and lesson's learned on implementation at the farm level.
2. Harmonized principles, operating guidelines and standards for shrimp aquaculture prepared and agreed. The principles would be based on further development of the operating principles developed during the Brisbane consultation, and in harmony with implementation of the FAO Code of Conduct.
3. Technical support provided to NACA members in development and implementation of better management practices in shrimp aquaculture. These might include rehabilitation of extensive farming areas (including mangrove replanting as appropriate), establishment of closed cycle systems and support provided for adoption of better practice among members.
4. Meeting of shrimp farmers associations in Asia held and a programme of work developed to promote effective cooperation and networking among private sector associations in NACA members and ensure an effective private sector ownership and input to the shrimp aqua-culture management activities of NACA.

Technological research and development

1. Formalisation of the grouper network and extension of regional networking to include other tropical marine fish species. An assessment would be made of the current grouper programme, and establish criteria by which performance is measured. Effective dissemination of findings from grouper research through training and workshops.
2. Study and regional workshop to share experiences on new marine fish species, the development of "offshore" marine cage culture in the region and map out areas for future regional cooperation in marine fish aquaculture, based on market demand and opportunities (tentatively to be hosted by Singapore in Sep/Oct 2002).
3. Analysis of research and development needs for development of improved feeds (environmentally friendly and fish meal replacement) to support marine fish culture. A network may be establishment for cooperative research and development the development of improved fish feeds.

Integration into coastal area management and development[2]

1. Study undertaken on small-scale poverty focused coastal aquaculture, and a suitable programme for regional cooperation established. The study would be undertaken as part of the STREAM process.
2. Special attention should be given to low input technologies, such as molluscs and seaweeds, and include enhancement where appropriate to small-scale fishers and poverty alleviation.
3. Technical guidelines on planning and environmental management of coastal aquaculture prepared. These will incorporate exchange of experiences on development models for coastal aquaculture, how they were established and operate as a collective development, and socio-economic benefits.

[2] The words "*and development*" were added by the group to emphasise that the programme will incorporate poverty issues and development concerns.

4. Technical support provided to members countries in coastal aquaculture planning and management based on these experiences.

Outreach and partnership

1. Assessment of current methods and needs for exchange of technologies and coastal aquaculture experiences.
2. Information dissemination, perhaps a web site established and TCDC exchanges promoted to support effective exchange of information and experiences on existing technologies (e.g. mud crabs, abalone, seaweeds) depending on needs.
3. Technical support in coastal aquaculture development, where possible to, for example, Korea, Indonesia, Pakistan and Cambodia

Follow up activities and other considerations

- Should ensure conformity to STREAM objectives, i.e. social issues should be included within the programme.
  - Means to secure investments in coastal aquaculture research and development (e.g. "business matching") should be assured.
- Species selection processes are of interest to several developing countries.
- The issue of reliance on wild stocks and seed has obvious linkages to other programmes and capture fisheries.
- The development of standards and certification of aquaculture products will become an important issue over the coming five years, including in importing markets. This is an area where close cooperation among NACA members will become increasingly important. Certification is a market driven process, but governments and NACA may technically support this process through development of indicators and standards, such as those evolving under the BMP programme above, and providing a better understanding of issues as such systems to ensure they provide benefits to small-scale farmers and the poverty focus of the programme.

- The *deliverable outcomes* may include information exchange among NACA members on certification activities and further study and workshop on indicators for sustainable aquaculture.

IV. Aquatic animal health management and disease control

1. Asia resource centres for aquatic animal health

- The detailed terms of reference (TOR) for the resource centres will be drafted by the NACA Secretariat and this will be tabled during the proposed meeting of the Asia Advisory Group on Aquatic Animal Health (AG) in October 2001.
- The Australian proposal for shrimp health diagnostics and networking and the recommendation from the APEC 02/2000 "Development of a Regional Research Programme on Grouper Virus Transmission and Vaccine Development" for a resource center on grouper diseases would be an excellent opportunity for realising the full potential of this element of the programme.

2. Harmonisation of procedures for health certification, quarantine and diagnosis.

- The project proposal on "Capacity and Awareness Building on Import Risk Analysis for Aquatic Animals" which was submitted to APEC FWG 12th Meeting (Hong Kong China, May 14-18, 2001) is a good development in this respect and the project will assist NACA in addressing the above issue.
  - The Australian proposal for shrimp health diagnostics and networking will be further pursued and will include establishing appropriate mechanism for cooperation with the Fish Health Section of the Asian Fisheries Society.

3. Support to capacity building

- The Working Group recommended that the **National Strategies on Aquatic Animal Health** be fully integrated into national programs on aquaculture development and that enhanced national level support to national level implementation of the **Technical Guidelines** should be put in place. A number of areas for capacity building are outlined in the *Bei-*

jing Consensus and Implementation Strategy (BCIS) of the Technical Guidelines and efforts will be undertaken by the NACA Secretariat to find support for assistance to countries on capacity building on aquatic animal health.

4. Awareness raising, Communication and Information Technology

- The Working Group recommended that industry participation be facilitated within this element of the Work Programme.

5. Regional and national disease reporting

- Further support the reporting system particularly in terms of capacity building, feedback mechanisms to farmers, analysis of disease reports and management of disease data and how it can be used in making policy decisions, emergency response to disease outbreaks at national levels.

6. Emergency response

- A regional workshop to share information and exchange experience will be explored by the NACA Secretariat. Australia has indicated that it may be able to share information and provide assistance in this area.

7. Joint activities for risk reduction in shared watersheds

- A workshop to discuss opportunities is recommended.

8. Rural aquaculture health management

- Implement the recommendations arising from *Dhaka Expert Workshop on Health Management* (Asia Regional Scoping Workshop on Primary Health Care in Small Scale Rural Aquaculture Development, Dhaka, Bangladesh, September 1999), particularly within the STREAM framework of NACA.

9. Other subject areas

- International cooperation for vaccine development where Australia, Singapore and Korea RO expressed strong interest.
  - This is one of the major recommendations of APEC 02/2000 and NACA Secretariat will initiate some preliminary discussion with participants of APEC 02/2000 from economies and private sector regarding this subject.

- Korea RO's proposal for some work on Iridovirus infection of marine fishes will be further taken up under the follow-up activities of APEC 02/2000 recommendation report.

V. Aquaculture genetics and biodiversity

1. Domestication and broodstock

- *Training and TCDC on broodstock management and national breeding programmes:* NACA will support members in training and TCDC for better management of broodstock and existing genetic resources. The following *deliverable outcomes* are envisaged:
- *Training and technical assistance provided through national and regional training programmes in broodstock management and national breeding programmes*. The training and TCDC support to make effective use of existing centers and regional expertise and in cooperation with other agencies (ICLARM, MRC) where possible.
- *Expert workshop on genetic selection and disease*
- *Expert workshop organized in cooperation with FAO and ICLARM.*
- *Identified plan of action* for regional cooperation on breeding of disease resistance in aquaculture stocks, including *Penaeus monodon*.

2. Aquatic biodiversity and indigenous species

- Sub-regional workshop on Himalayan indigenous fish species
  - NACA will support the Himalayan sub-regional workshop hosted by the Government of Nepal.
  - Himalayan sub-regional workshop implemented in Nepal and a cooperative plan of follow up action prepared.
- Aquaculture of indigenous fish species
  - NACA will continue to promote cooperation with the MRC in indigenous Mekong fish species, particularly to ensure effective exchange of information arising from the MRC supported work.

- Within eNACA, establishment of information on aquaculture species profiles that would include indigenous species.

3. Policy guidelines

- NACA will support the development of regional policy guidelines on movements of genetic materials ("improved" strains and exotic species) for consideration and adoption of a common regional policy guidelines by the NACA member countries. In the short-term, the workplan will emphasise the following *deliverable outcomes*:
  - Development of a working paper for consideration of the NACA Governing Council on the issues and steps required for development of the regional policy guidelines.
  - Cooperation with the MRC and FAO to support countries in the lower Mekong basin in the development of a practical approach and strategies for transboundary movements of live aquatic animals, from a genetic and disease perspective.

VI Education and training

1. Short-term training

- The NACA Secretariat will create and maintain a database and inventory of all training courses in the region (broader than just aquaculture and aquatic resources). This should form the basis for sharing of training resources including staff throughout the region. The database should also include likely sources of travel, educational grants and other funding. Database information will be made available through eNACA.
- The NACA Secretariat will administer *ad hoc* requests for short term training within the next $2^1/_2$ years **(Appendix 1).**
- NACA should plan `open courses'. An example given was the shrimp health management training workshop in collaboration with AAHRI. The group identified an open course on aquaculture business opportunities, development and management for entrepreneurs. This course could be conducted in-country by a team, in collaboration with appro-priate na-

tional groups or organizations. The course will be fully costed and is meant to generate income. Local support would be required for administration and field visits. The importance of tailoring the course to the needs of the private sector and other stakeholders, and promoting it to attract participation (at their own cost) was pointed out. It was also considered as very much in line with NACA's core business of rural development.

- Other training courses such as the cage culture course in Singapore, UNESCO-supported courses in Qingdao, China, and shrimp fry production in Malaysia are available NACA Secretariat should continue to place trainees on such courses based on NACA priorities.

2. Technical exchanges and TCDC

- NACA secretariat should continue to pursue TCDC principles; continue to support the training of Integrated Fish Farming in China; and assist other member countries to establish relevant courses.
- NACA should co-ordinate its activities with VSO, DFID and FAO to further facilitate training exchanges and to facilitate farmer-farmer exchanges.
- Because STREAM is a core activity, basic awareness raising and training in livelihood analyses should be provided

3. Regional cooperative aquaculture education programme

- NACA should actively support and participate in the expert group on Aquaculture Education in the Asia Pacific group, being formed as a result of the Expert Consultation on Aquaculture Education in the Asia-Pacific. A meeting is scheduled for June/July 2001, and NACA should bring forward its priorities to be included in the overall planning of the regional cooperative aquaculture education program.
- The proposed NACA Post-graduate education scholarship program (doctorate and post-doctorate scholarships) should be integrated with the regional cooperative aquaculture education programme. Research topics should be aligned with the identified R&D priorities in the network (i.e. as identified in the above working group reports) and reflect NACA's goal

of making aquaculture a knowledge-based activity. These should also support the focus on poverty alleviation.

4. Follow-up activities and special considerations

- To ensure that NACA's new focus on rural development/poverty alleviation is implemented, the NACA Secretariat should examine the balance of costs allocated to the post-graduate education programme against the funds allocated for livelihoods and farmer-focused training.
- NACA should also adopt, where practical "distance training " technologies. Several institutions (SEAFDEC AQD and the University of the Philippines Open University, Deakin University, and AIT) have developed or are beginning to develop distance learning training. NACA should promote networking and information exchange in this area.
- To improve and develop the NACA training activities, further assessments should be done of the impact of training offered through NACA.
  - NACA should request copies of post-short course evaluations and provide an analysis of training feedback.
  - NACA should conduct a tracer study to assess the impact of short courses based on success of their trainees in applying the learning and progressing sustainable aquaculture development**;** donor interest – particularly those that have sponsored people to attend the training courses – should be explored

VII. Partnership and expert-centered collaboration

1. People-centered networks

- There was strong support for an expansion of people-based networks in selected technical areas to augment the existing Centre-based Network. Initial priority should be given to 1) *aquafeeds* (nutrition, feed development, feed management) and 2) s*hrimp health*, the latter to be developed in close consultation with the AFS Fish Health Section

2. Follow up

- Given the critical importance of extension and the fragility of current national systems, the meeting suggested that the Se-

cretariat should examine opportunities and mechanisms to promote the effective exchange of extension experience and information within and between countries.

VIII. Code of Conduct for Responsible Fisheries (CCRF) and Committee of Fisheries (COFI) Aquaculture Sub-Committee meeting

1. **The recent joint work by NACA, FAO, WWF and WB (Consortium) on shrimp aquaculture and environment should be synthesized and presented to the COFI/SCA meeting for discussion, consensus and advice on follow up actions.** The group recognised that the COFI/SCA provides an opportunity to present the work of the consortium and how to move forward.

2. **The working group suggested the following items be considered as a collective submission to the first COFI/SCA by NACA**.

- Trans-boundary aquatic animal movement issues and related implications to aquaculture.
- Integration of aquaculture into rural development and related livelihood issues
- Implementation of the Code of Conduct for Responsible Fisheries
- Work on the Shrimp Aquaculture and the Environment

IX. e-NACA

1. Information packages

- The first information packages to be entered on e-NACA should be information relating to the NACA priority areas as identified by the other Working Groups in TAC-6.eg coastal and inland aquaculture, health and STREAM
- Other information on species and systems, a directory of activities, current issues for NACA and coming events and workshops should be developed as resources permit
- A cornerstone for *e-NACA* would be an interactive country profile data base and reporting mechanism, developed as

outlined in the next element of the work plan (Country Profiles)

X. Country Profiles

1. **Study of a Country Profile leading to a pilot project to develop country profiles.** NACA Secretariat would develop a country profile template for input from member countries. The TAC members would be national focal points for subsequent development of the template.

Special consideration

- The Country Profiles could be presented as a web-based interactive data/information base with facilities to interrogate the database and extract information as they are required by different stakeholders such as policy makers, producers, scientists, researchers, etc.
- Because data and information are collected independently by countries within NACA, the country profile should form the building block for subsequent reporting and analyses
- The first country profiles should focus on aquaculture activities and include information on species being cultured and systems used, policies and regulations in force, and include basic production and export trends (avoid duplication by other agencies)
- The country profiles should be planned and implemented as part of an electronic interactive database so that different aggregations of the data and information can be derived (e*g* species information and data across the region).

XI Activities to support outcomes, including follow-up from TAC-6

The development of STREAM should be pursued as a core initiative under the new NACA Work Programme in line with the directions provided by the NACA Governing Council. A common theme in considering almost all aspects of the NACA 2 ½ years work plan was that traditional activities were more easily identified and supported while new activities to support the new focus of NACA in addressing poverty alleviation were more vague and required further work. The emphasis should be directed towards national consultations in three to four countries to provide national stakeholder input and develop the detailed operational structures and arrangements for implementation of STREAM. A further regional consultation could be held on STREAM once such country level consultations have been held

Appendix 1

Planned, ongoing, requested training and list of identified training subjects[1]

1. Regular courses

The *Integrated Fish Farming Training Course* (IFF Course) is an existing three-month regular course, which will be continued through 2001–2003. Apart from the Chinese TCDC funding for local cost and expenses for running the course, assistance from NACA is required for the course organisation and securing additional funding for international travel of trainees. The course feature is not well reflected by its title because it covers most essential aspects of freshwater aquaculture, and so far it has been technically backed mainly by FFRC/RLCC alone on the basis of Chinese experiences.

Proposed plan of action for future IFF courses:

- Identification of other resource centres of NACA for assistance in future IFF courses (starting from 2002)
- Development of training modules by the identified centres of recognised technical competence in certain area for use in the IFF course
- Review and revision of the existing IFF course outline and integration of new modules into the course outline
- There is the need to re-establish the regional training programme at the RLC in India under the auspice of ICAR and build it up to a regular course in future with the resource available.

2. Open courses

Shrimp Health Management Training Workshop. This Bangkok-based open course is jointly organized by Aquatic Animal Health Research Institute (AAHRI) and NACA.

[1] Does not include those under Aquatic Animal Health Programme and STREAM

The beneficiaries pay for the cost of course organization as registration fee (US$750) and the break-even number of trainees is 10. The 2001 session is planned for 25-30 June and will carry on. It will be offered annually.

Proposed plan of action to instigate new open courses:

- *Aquaculture Project Planning, Development and Management (for entrepreneurs),* in collaboration with SEAFDEC AQD and AIT.

3. Other training courses

- *International Training Workshop on Inland Fisheries and Aquaculture for Sustainable Development* (tentative course title) is planned for 1-28 September 2001 based at RLCC, Wuxi, China. Core funding is available locally to cover the local expenses in Wuxi for 15-20 participants from APEC economies. The course is prepared to accommodate participants from non-APEC economy NACA members. Special remarks about this activity is that it may not necessarily to be a pure "training". It could be a workshop related to inland aquaculture. The TAC working groups are required to recommend strategies for the organization of this activities.
  - *Marine Pharmacology, Chemical Products of Seaweeds and Cultural Technology of Seaweeds Training Course*, is offered in October 2001 by the Ocean University of Qingdao, a collaborating institute in China. NACA is assisting in recommending and selection of candidates for attendance from its APEC economy members.
  - *Mariculture (Grouper) Training Course* is planned for 2001 in Gondol, Indonesia.
  - *Marine Cage Culture Training Course* will be offered by Singapore in 2001. NACA is to select and recommend some candidates from member states for participation.

4. Planned Training Courses

NACA Governing Council and Task Force recommended planning three new training courses with the recognised regional and national centres for implementation under the new work programme. The three new courses are the following:

- *TCDC based freshwater aquaculture training course in India*
  - Host institute/s: The Central Institute of Freshwater Aquaculture (CIFA) in Bubhaneswar, and its sister institutes under the Indian Council of Agricultural Research
- *Training programme on small-scale household aquaculture in Vietnam*
  - Host institute: Research Institute for Aquaculture No. 1 (RIA-1), Hanoi
- *Integrated Coastal Sea Farming Training Course*
  - Host institute: Yellow Sea Fisheries Research Institute (YSFRI) in Qingdao

Proposed plan of action for the three new courses:

- Development of strategy for co-funding and work out time frame for implementation based on available and possible funding
- Development of course outline and curriculum that addresses new emerging issues
- Identifying more collaborating institutes for course implementation

5. Ad hoc requests for training assistance (in 2001)

Required training subject	Request by	Targeted institute/country
Seaweed aquaculture	Cambodia	China Philippines Vietnam
In-country training in freshwater fish processing and handling	Nepal	CIFT, India
In-country demonstration and training in Mahseer breeding and nursing	Pakistan	Nepal
Ornamental Fish and Plants Culture	FFRC, Malaysia	DOF, Thailand
Freshwater pearl culture and clam breeding	Philippines, Sri Lanka	China
Culture and breeding of freshwater prawn *M. malcomsonii* prawn	China	India Sri Lanka
Abalone larvae culture	Thailand	China
Cage culture of tilapia and indigenous fish	Lao	Thailand
Fish processing and quality control HACCP	Sri Lanka	Thailand India Singapore

6. Training needs of high priority by country (in addition to prioritized regional needs)

AUS	• Integrated agriculture-aquaculture, • Sustainable shrimp production • Aquaculture systems for community development
BGD	• New technological transfer into Bangladesh through training • Study tours of Department of Fisheries personnel to other countries • Integrated aquaculture-agriculture techniques for rural farmers
CAM	• General aquaculture training for staff development purpose • Shrimp disease control and health management • Breeding of indigenous species (such as sand goby) • Support for research and extension • Collaborative aquaculture education program • Seaweed culture
CHN	• High tech training for professionals and technologists • Farmers' certification training • Training of fish health and quarantine personnel • HACCP and fish quality control • Culture and seed production of new species
HOK	• Larval rearing of groupers (attachment programme) • Collaborative education program
IND	• Marine fin fish breeding and culture • Marine shrimp hatchery operation • Shrimp health management
INS	• Shrimp and fish diseases • Breeding and hatchery seed production of marine fish • Grow-out culture techniques of marine fish species
DRK	• Fish health management • Disease diagnosis and prevention • Breeding techniques of species new to DPRK • Integrated coastal sea farming

Training needs of high priority by country (in addition to prioritized regional needs) *(Continued)*

ROK	-
LAO	• Extensive and semi-intensive farming systems • Improved fish breeding and nursing techniques • Effective extension approaches and methodology • Fish disease prevention and control • Feeds and feeding techniques • Breeding of indigenous species
MAL	• Improvement of traditional food processing • Fish disease and health management • Ornamental plants and fish breeding and nursing
MYA	• Manpower training for skills and for technology in various areas (marine, brackish, freshwater, export and quality control, fish health, and aquarium management) • In-country training and advise • Marine shrimp aquaculture • Seabass and grouper aquaculture • Carp feed and nutrition, and farming system • Marine fish broodstock development, breeding and culture • Reservoir enhancement for which China could assist in capacity assessment and culture-based fisheries.
NEP	• Staff training and HRD • Fish processing and quality control
PAK	• Culture of mountain species • Culture-based fisheries • Staff training and HRD
PHI	• Non-technical issues for aquaculture development • Improvement of aquaculture products quality • Farmer-to-farmer visit programme
SIN	• Sea farming/cage culture • Marine fish hatchery • Red tide warning and diagnostic information system • Risk management
SRL	• Farmer training • Degree-level staff training and HRD • Ornamental fish • Culture-based fisheries in reservoirs

Training needs of high priority by country (in addition to prioritized regional needs) *(Continued)*

THA	• Subsistence aquaculture • Resources management for sustainable use • Food quality and safety standards improvement • Ornamental and aquatic plants
VNM	• Fish health management and quarantine • Coastal and marine aquaculture • Marine fish hatchery • Sandy site aquaculture • Staff training

NACA's Member-Governments

Australia
Bangladesh
Cambodia
China
Hongkong, China
India
Korea (DPR)
Malaysia
Myanmar
Nepal
Pakistan
Philippines
Sri Lanka
Thailand
Vietnam

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Singapore
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